 **UNIVERSITY OF MAINE AT FARMINGTON**

**COLLEGE OF EDUCATION, HEALTH AND REHABILITATION**

**LESSON PLAN FORMAT**

**Teacher’s Name:** Ms. Libby **Lesson #:** 2 **Facet:** Application  
**Grade Level:** 9th Grade **Numbers of Days:** 1- 2 Days  
**Topic:** Algebra  
  
**PART I:**  
**Objectives**  
Student will know understand that the same solution techniques used to solve equations can be used to rearrange formulas.   
Student will know equation, properties, and inequalities.   
Student will be able to use the same solution techniques used to solve equations, to rearrange formulas.   
**Product:**Mind Mapping  
  
**Maine Learning Results (MLR) or Common Core State Standards (CCSS) Alignment**  
**Math Common Core State Standards**  
**Content Area:** Algebra  
**Grade:** High School  
**Domain:** Reasoning with Equations and Inequalities  
**Cluster:** Solve systems of equations  
**Standard:**  
6. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically  
**Rationale:**  
Students will meet standard seven by creating equations using real world examples and solving them using graphic organizers to synthesis their data.  
  
**Assessments**  
**Formative (Assessment for Learning)**  
**Section I – checking for understanding during instruction**  
Students will use the Example/non-example to work out problems as a group and figure out the main concept while breaking it down step by step.  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will get help from other group members and assess each other’s work.   
Teacher will look over the graphic organizer to make sure that the students have the correct information  
  
**Summative (Assessment of Learning):**  
Mind Mapping (50 points) Students will create a graphic organizer containing formulas and solution techniques. They will then come up with examples for each solution technique. Students will leave an extra space for other examples and formulas and there will be a day in class where students will get into groups and each say their example and write down new examples that were discussed and other solution techniques they did not have. Students will be able to keep this graphic organizer as a study tool for the rest of the year and can continue to add to it as new examples and techniques arise throughout the course.  
  
**Integration**  
**Technology:**  
Students will be using mind mapping to create their own graphic organizer. This will help them formulate the data and organize the formulas and solution techniques in a way that is easily readable for them.  
**Content Areas:**  
**English:** Students will be constant writing the English Language as they create the graphic organizer. They will be writing down the solution techniques and formulas to help the solve linear equations.  
  
**Groupings**  
**Section I - Graphic Organizer & Cooperative Learning used during instruction**  
The teacher will split the class into groups to work on a problem and then ask one member from each group to stand up and move to another group to compare answers. The students will use the sequence chart to keep track of each step they use to solve the problems so that if they need to fix their answers it is easier to spot the error.  
**Section II – Groups and Roles for Product**  
Students will individually use mind mapping to create their own graphic organizer but then they must share the organizers they came up with their fellow classmates. The classmates will then have to check to see if the solution formulas and techniques are correct. If they are not correct, then they will make notes and write down the correct formula on the graphic organizer.  
  
**Differentiated Instruction**  
**MI Strategies**  
**Verbal:** The students will be talking to their peers in groups to answer the questions the teacher provides. This way they can talk through their thinking with other peers.  
**Logic:** Students will be recording their answers on the sequence chart which will help them break down their thinking.  
**Visual:** Since the students are writing down their steps, they get to do it in a way that best suits them. There will be an example of how to create the graphic organizer on the board and we will go over it in class so that they have something to look at while also completing the graphic organizer.  
**Musical:** The teacher will make an audio recording of how to fill out the graphic organizer with a tutorial online so that the students can look and listen to it if they need to fill it out at home.  
**Kinthestic:** The online tutorial will show the student how to complete the graphic organizer and they can follow along so that they are engaged and physically doing the work while listening to the steps. These students will also be the ones that move from group to group to keep them moving while thinking.  
**Intrapersonal:** The students will be working on the graphic organizer alone for the first part of the lesson.  
**Interpersonal:** Once the students work alone, they will be split into groups to work on a different problem. Then one person from each group will go and switch to another group and compare answers.  
**Naturalist:** The problems that the teacher uses for the class to work on will consist of real world samples involving nature. An example is, finding the slope of a tree branch in relation to the tar or cement.  
  
**Modifications/Accommodations**  
***From IEP’s ( Individual Education Plan), 504’s, ELLIDEP (English Language Learning Instructional Delivery Education Plan)****I will review student’s IEP, 504 or ELLIDEP and make appropriate modifications and accommodations.*  
  
**Plan for accommodating absent students:**  
Students will have a Skype buddy that was assigned at the beginning of the year and they will Skype into class if a computer is available to them. Students that miss the lesson will have an absent folder with all the worksheets on linear equations that their fellow classmates have completed. Students will have to still complete their own graphic organizer using mind mapping but they will have the worksheets and other graphic organizers that the teacher has made as a guide for them to use. Students can come to the office hours of the teacher to go over any worksheets and to go over the graphic organizer to check and see if they have the correct formulas and solution techniques. If needed, the students will meet with the teacher after school to go over the missed work.   
  
**Extensions**  
**Type II technology:**  
Students will be using mind mapping to create their own graphic organizer. This will help them visualize the formulas and solution techniques in a way that best works for them. The teacher will be able to see the different graphic organizers and check to see if the solutions are correct. If they are not then the students can create another graphic organizer with the correct solution techniques. They will also be required to create their own examples and solve them on the graphic organizer.  
**Gifted Students:**  
Gifted students will still create their own graphic organizer but instead of correcting other student’s graphic organizer, they will have to find other graphic organizers online and will have to change it to fit their own examples.  
  
**Materials, Resources and Technology**  
Graphic Organizer (Sequence Chart)  
Laptops  
White Board  
White Board Markers  
Graphing Papers  
Calculators  
  
**Source for Lesson Plan and Research**  
**Save the Zogs (Hook):**  
<http://www.mathplayground.com/SaveTheZogs/SaveTheZogs.html> This provides the website where the students will play save the zogs when they first come to class.  
**Math Vocabulary/Definitions:**  
<http://www.crctlessons.com/math-vocabulary.html> This is where all the mathematical definitions the students will need are located for easy access.  
**Mind Mapping/Web 2.0 Tools:**  
<http://www.mindomo.com/> This is where students can create their own graphic organizers.  
<http://cooltoolsforschools.wikispaces.com/Organiser+Tools> This is where the teacher can find other mind mapping tools to use for the students.  
**Checking for Understanding (Example/Non-Example):**  
[http://edu221spring11class.wikispaces.com/file/view/strategies.pdf](http://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf) This is where all CFU are located and explains the specific CFU for this lesson is listed.  
**Graphic Organizer (Sequence Chart):**  
<http://www.eduplace.com/graphicorganizer/pdf/sequence.pdf> This provides the students with the graphic organizer they need to help synthesize their data and thinking.  
**Cooperative Learning:**  
<http://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/373762896/cooperative_learning_strategies.pdf> This provides many strategies on Cooperative learning and where the specific CL for this lesson is listed.  
  
**PART II:**  
**Teaching and Learning Sequence (Describe the teaching and learning process using all of the information from part I of the lesson plan)***Take all the components and synthesize into a script of what you are doing as the teacher and what the learners are doing throughout the lesson. Need to use all the WHERETO’s. (3-5 pages)*  
  
*Classroom Arrangement:* Students desks will be in groups of three or four all facing each other.  
  
**Agenda:**  
Day One (80 minutes):

* Beginning of class overview (20 minutes)
  + Attendance (3 minutes)
  + Check Blogger accounts (17 minutes)
* Hook (10 minutes)
* Class discussion on linear equations using multiple graphic organizers (25 - 30 minutes)
* Students will create their own linear equations (20 minutes)

Task: Students must create their own graphic organizer using mind mapping  
  
Day Two (80 minutes):

* Beginning of class overview (15 minutes)
  + Attendance (3 minutes)
  + Look over graphic organizers as a class (12 minutes)
* Cooperative Learning (40 minutes)
  + Example/Non-Example (15 - 20 minutes)
  + Students will look over each other graphic organizer (20 minutes)
* Students work on solving their own examples using graphic organizers (15 minutes)
* Q+A (10 minutes)

Task: Complete graphic organizer if not already finished in class.

Students will understand that the same solution techniques used to solve equations can be used to rearrange formulas. If students are buying CD's and need a certain amount but the need to know how many CD's the manufacturer ships in each box, they will need to create a linear equation for how many CD per box and then they will know how many boxes to buy. *Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.* Students will arrive to class while the teacher is playing "Save the Zogs" computer game. As a collective class, the students will try to save the Zogs using linear equations.  
**Where, Why , What, Hook, Tailors:***Logical, Visual, Musical, Intrapersonal.*  
  
Students will know equation, inequalities, variable. **(See content notes for definitions)** I will write examples of each definition on the white board and have students come up with their own written definition that will help them better understand it. I will have multiple examples for each vocabulary word and have students solve them by verbally explaining to me the steps on how to find the solution. The teacher will split the class into groups to work on a problem and then ask one member from each group to stand up and move to another group to compare answers. This will allow the students to make sure they are all on the same page. If one group of students does not have the same answers as another group, that one member will be able to compare those answers and see if either their group or the other group has the wrong answers. If their original group has the wrong answers, than that one student will collect the correct answers and bring them back to their original group. If their second group is wrong than the one person will provide the new group with the correct answer and explain why it is correct. The students will use the sequence chart to keep track of each step they use to solve the problems so that if they need to fix their answers it is easier to spot the error. Students will use the Example/non-example to work out problems as a group and figure out the main concept while breaking it down step by step.  
**Equip, Explore, Rethink, Tailors:***Logical, Intrapersonal.*  
  
Students will be able to use the same solution techniques used to solve equations, to rearrange formulas. The teacher will split the class into groups to work on a problem and then ask one member from each group to stand up and move to another group to compare answers. The students will use the sequence chart to keep track of each step they use to solve the problems so that if they need to fix their answers it is easier to spot the error. I will assign groups before the unit starts and will change the groups if I see fit according to any student grouping problems. I will be bringing in outside objects and trace the objects on to a coordinate plane. This way the students will find the slope of a tree branch as an example. I will have the students do an activity called Example/Non-Example. The students will be given a concept and they will have to create examples that prove that concept and they will also have to create non-examples that do not prove that concept. Throughout the lesson the students will be working on creating their own graphic organizers. They will also have to come up with their own examples that they will solve using their graphic organizers. The teacher will look over the graphic organizer to make sure that the students have the correct information. Students will also be able to get help from other group members and assess each-others work. As I am looking over the graphic organizers, I will be able to see if the students fully grasp the concept or not. If they do than I can modify my future lessons to include harder more complex work to see if my students will understand that. If the students do not understand the concept than I will modify my future lessons to make sure that I cover the graphic organizers and solutions to linear equations again before moving on to more complex concepts.   
**Explore, Experience, Revise, Refine, Tailors:***Intrapersonal, Visual, Kinesthetic, Naturalist, Interpersonal.*  
  
Students will self-assess and have their peers assess their graphic organizers. This way they know if they have the correct information on their graphic organizers. Students will read each other’s graphic organizers and see if the solution techniques are correct. The teacher will also go and check the graphic organizers to make sure that every student has the correct formulas and solution techniques. Gifted students will have to find online graphic organizers that already have examples on them. They will then have to put their own examples into the graphic organizer and solve using the formulas that were given on the organizer. This lesson will help student be prepared for future studying to better understand and to soon master the concept of linear equations. This graphic organizer provides the students with a study sheet that they created and can understand the way they learn best. It will have multiple examples that they can look back on when solving other problems in future lessons.  
**Evaluate, Tailors:** *Logical, Intrapersonal, Interpersonal.*  
  
**Content Notes**  
Students will know…..   
*Vocabulary Definitions:*

* Inequalities
* Linear Equation
* Variable

*Variable:*  
A variable is a letter representing one or more numbers. An example of this is 2x – 5 = 1 where ‘x’ is the variable in this equation. The variable ‘x’ is a number that we do not know yet and we must solve the equation in terms of ‘x’ to find out. To solve for ‘x’ you have to it away from the rest of the numbers by moving 5 to the other side of the equal sign. You have to do the opposite of what the number is. So since the equation says that 2x is *subtracting* 5, you have to *add* 5 to the other side. The equation than becomes:  
2x = 5 + 1  
OR  
2x = 6  
The next and final step is to get the number that is attached to ‘x’ away. We have to remember to do the opposite of whatever that number is already doing. So 2 is being *multiplied* by ‘x’ which means you have to *divide* 2 to the other side of the equal sign. That will give us the answer of **x = 3**  
  
Inequality:  
An inequality is a mathematical sentence that compares two quantities that do not equal each other. There are a two main ways to compare quantities:  
> (Greater than)  
< (Less than)  
An example of this is 2 + 3 < 97 – 82 This is saying that 2 + 3 is less than 97 - 82  
To check that this is true, you solve both sides separately which will make this 5 < 15 which saying that 5 is less than 15 which is correct.  
Linear Equation:  
A linear equation is an equation whose graph is a straight line in the coordinate plane. The equation can be written like y = 2x -3 This was written using the slope-intercept formula which is defined below.  
  
**Handouts**  
Graphic Organizer (Sequence Chart)  
Graphing Paper  
  
**Maine Common Core Teaching Standards for Initial Teacher Certification and Rationale**  
*Standard 1 – Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.*

***Learning Styles***  
***Clipboard:*** The expectations for the class are clearly posted inside the classroom and on the class website. It covers everything that is expected and nothing is left to interpretation unless otherwise discussed with me. The students will be given graphic organizers to better synthesis their data and organizer their formulas and solution techniques.   
***Microscope:***There will be graphic organizers for every part of the unit so students will be able to write down their learning process. There will be checking for understanding throughout the lessons so students will always know if they are retaining the correct information or not. Class collaboration will allow the students to work together and constantly think deeper into the subject.  
***Puppy:***Students will be seated in groups of threes so there will always be peer support for each student. I will constantly be walking around the classroom ready to help one-on-one with students that have any questions or confusion on certain tasks. Online tutorials will help students as an extra support when they are at home and need guidance. Classroom expectations will be posted inside the classroom to create a helping and respectful environment for everyone.  
***Beach Ball:*** Students will be able to create their own graphic organizer the way that best suits them. This will allow them to be creative and use the ways that works for them. Students will also be creating their own linear equations and will have to solve them using the graphic organizer that they created.   
***Rationale:*** This lesson meets the standard because I know different strategies to appeal to all kind of learning styles. Students will have multiple opportunities to prove their understanding to further their knowledge in the unit. This lesson requires students to think critically in order to solve the equations but they will have the freedom to choose what equations to solve and the liberty to come up with their own equations.  
  
*Standard 6 -* *Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their on growth, to monitor learner progress, and to guide the teacher's and learner's decision making.*  
  
*Formative:*  
**Section I – checking for understanding during instruction**  
Students will use the Example/non-example to work out problems as a group and figure out the main concept while breaking it down step by step.  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will get help from other group members and assess each other’s work.  
Teacher will look over the graphic organizer to make sure that the students have the correct information  
  
*Summative:*  
Mind Mapping (50 points) Students will create a graphic organizer containing formulas and solution techniques. They will then come up with examples for each solution technique. Students will leave an extra space for other examples and formulas and there will be a day in class where students will get into groups and each say their example and write down new examples that were discussed and other solution techniques they did not have. Students will be able to keep this graphic organizer as a study tool for the rest of the year and can continue to add to it as new examples and techniques arise throughout the course.  
  
***Rationale:*** This will let me know where the students are in their understanding of the concept. By having to create their own linear equations, they will have to use the solution techniques that were previously discussed in class. I will use this information when planning future lessons and it will determine whether I give further instruction in linear equations or if I see if the students will be able to grasp more complex concepts. Formative assessments will be used multiple times in my lessons so that I will constantly know where my students are at in terms of mastering the concept.   
  
*Standard 7* - *Planning Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.*  
  
*Content Knowledge:*  
Students will know equation, inequalities, variable.  
  
*MLR or CCSS:*  
**Math Common Core State Standards**  
**Content Area:** Algebra  
**Grade:** High School  
**Domain:** Reasoning with Equations and Inequalities  
**Cluster:** Solve systems of equations  
**Standard:**  
6. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically  
*Facet:*Application  
  
*Rationale:*  
Students will meet standard seven by creating equations using real world examples and solving them using graphic organizers to synthesis their data.  
  
*Standard 8 -* *Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.*  
  
*MI Strategies:*  
**Verbal:** The students will be talking to their peers in groups to answer the questions the teacher provides. This way they can talk through their thinking with other peers.  
**Logic:** Students will be recording their answers on the sequence chart which will help them break down their thinking.  
**Visual:** Since the students are writing down their steps, they get to do it in a way that best suits them. There will be an example of how to create the graphic organizer on the board and we will go over it in class so that they have something to look at while also completing the graphic organizer.  
**Musical:** The teacher will make an audio recording of how to fill out the graphic organizer with a tutorial online so that the students can look and listen to it if they need to fill it out at home.  
**Kinthestic:** The online tutorial will show the student how to complete the graphic organizer and they can follow along so that they are engaged and physically doing the work while listening to the steps. These students will also be the ones that move from group to group to keep them moving while thinking.  
**Intrapersonal:** The students will be working on the graphic organizer alone for the first part of the lesson.  
**Interpersonal:** Once the students work alone, they will be split into groups to work on a different problem. Then one person from each group will go and switch to another group and compare answers.  
**Naturalist:** The problems that the teacher uses for the class to work on will consist of real world samples involving nature. An example is, finding the slope of a tree branch in relation to the tar or cement.  
  
***Type II Technology:***  
Students will have to create their own graphic organizer using mind mapping. They will have to come up with their own examples and use the graphic organizer to solve it. They will have to come up with multiple examples so that they will have an example for every type of linear equation that is discussed in class. They will have to make sure that they used the correct solution techniques and used the correct formulas.   
  
***Rationale:***  
This lesson incorporates six of the multiple intelligences to ensure that every student is learning to they way that they learn best. For those students who cannot use their number one multiple intelligence, they will have a chance to use their second best multiple intelligence for this lesson. That way they are still learning to the way that they can succeed the most.   
  
***NETS STANDARDS FOR TEACHERS***  
**1. Facilitates and Inspire Student Learning and Creativity. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.**  
a. Promote, support, and model creative and innovative thinking and inventiveness  
  
b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources  
  
c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes  
  
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments  
  
*Rationale:*  
Students will have to think critically in order to fill out the sequence chart. I will be constantly walking around the classroom to check the graphic organizers that were given to the students and the graphic organizers that the students created. Students will have to come up with their own examples on how to solve different linear equations. They will have to solve these equations using the graphic organizer that they also created. Students will be exposed to creative uses of technology and how the math applies to the real world.   
  
**2. Design and Develop Digital Age Learning Experiences and Assessments. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop knowledge, skills, and attitudes identified in the NETS-S.**  
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity  
  
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress  
  
c. Customize and personalize learning activities to address students’ diverse learning styles, working strategies, and abilities using digital tools and resources  
  
d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching  
  
*Rationale:*  
Students will use mind mapping to create their own graphic organizers. This will help them synthesis their data using the way that works best for them. This type II technology allows the students to create their own graphic organizer and provides many options for which ones they would like to use. They can constantly go back and create new ones as they further their understanding of the concept. Through formative and summative assessments, students will have multiple opportunities to prove whether or not they actually understand the concept or not and to what extent. Students will have the opportunity to learn according to their learning style and multiple intelligence.